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ABSTRACT

Ponderosa and lodgepole pine trees were severely defoliated by the sawflies, Neodiprion nanulus contortae, and N. fulviceps complex, within the Little Rockies division of the Lewis and Clark National Forest, Montana. The infestation has increased from 6,000 acres in 1959 to about 11,000 during 1961.

Data about the sawfly population were obtained from infested areas within the Little Rockies during October. The evaluation method used was based on the average number of twigs, out of 1,000 per infested area, that contained sawfly eggs inserted into current season needles. The procedure for using this method is outlined.

A polyhedrosis virus reduced the sawfly population to a low level in September throughout the Little Rockies. Predicted defoliation of 1961 foliage during 1962 is from 0 to 25 percent.

Ninety-three percent of the sawfly eggs examined in October were viable. Egg viability was greater in ponderosa pine twigs than in lodgepole.

Sawfly larvae may be controlled in the future with an inoculum made from the virus.

INTRODUCTION

Two sawflies, Neodiprion nanulus contortae (fig. 2), and N. fulviceps complex, severely defoliated about 11,000 acres of ponderosa and lodgepole pine trees within the Little Rockies division of the Lewis and Clark National Forest, Montana, during 1961.[1/] The infestation covered 6,000 acres in 1959 when it was first reported. It probably had been active for several years prior to 1959. The timber type is composed mainly of sapling-size lodgepole pine trees. Islands of pole-size ponderosa and lodgepole,

1/ Sime, D. G., 1961. The 1961 sawfly infestation in the Little Rockies. (Unpublished report written on Sept. 12, 1961, and submitted with a memorandum from M. F. Phillip to the Regional Forester on Sept. 25.)

and sawtimber-size ponderosa pine trees occur on ridge tops, and in some ravines. These islands are remnants of stands left after a forest fire in 1936 consumed most of the trees within the Little Rockies area. It seems the sawfly infestation has spread from these islands. Heavy defoliation has been consistent in them and many trees are now dead (fig. 3).

The infestation has increased each year in reproduction stands surrounding these isolated islands of overstory trees, especially on dry, open, south and east facing ridges and slopes.

Data[2/] in May indicated that defoliation would be quite heavy in areas (fig. 1) of the Little Rockies during 1961. This prediction proved to be true when the infested areas were examined in July. The examination also indicated that a polyhedrosis virus was greatly reducing the sawfly population.

POLYHEDROSIS VIRUS

Sawfly eggs that were collected in May for rearing began hatching on June 5. About one week later some larvae began to darken in color and die. By July 5 all the larvae were dead. Dr. C. G. Thompson of the Western Forest Insect and Disease Laboratory at Corvallis, Oregon, determined that the primary cause of death appeared to be from a polyhedrosis virus.

The field population of sawflies was examined on July 20. Numerous dead larvae with typical symptoms of virus were present in all infested areas within the Little Rockies. These cadavers were dark in color, wilted, and hung head down from needles. Many larvae brought back for rearing in July died, but some pupated by July 24. Adult sawflies never emerged from the pupal cases. The virus may have killed them.

The description of the polyhedrosis virus disease epidemic throughout the sawfly population is being emphasized in this report, because it was capable of reducing a heavy sawfly population to a very light one in three and one-half months.

METHODS

During October 1961 data were obtained from the six areas in Figure 1 by using a sampling method developed by Kapler and Benjamin.[3/]

2/ Tunnock, S., 1961. Biological evaluation of a pine sawfly infestation in the Lewis and Clark National Forest, Montana, May 1961. (Unpublished report of the Forest Insect Laboratory, Intermountain Forest and Range Experiment Station, Forest Service, U. S. Dept. Agr., Missoula, Montana.) (Processed)

3/ Kapler, J. E. and D. M. Benjamin, 1961. Redpine sawfly survey procedure. Cooperative economic insect report, Agr. Research Serv., U. S. Dept. Agr., 11: 235-239. (Processed)

This method proved to be applicable to the sawfly problem in the Little Rockies when used in May. This method of evaluation was adopted for the October survey, as follows:

Fifty twigs per random plot were removed from currently defoliated trees and examined for sawfly eggs. The number of plots per infested area depended upon area size. Each infested area in the Little Rockies (fig. 1) was of sufficient size to require twenty 50-twig plots. This meant that 1,000 twigs per area were examined for eggs. The average number of twigs bearing eggs on the current year's (1961) needles was used to classify the infestation.

Heights of trees to be examined and stand density influenced the procedure employed on each plot. Three different stand classifications appeared appropriate to this survey and the methods used for each are outlined below:

I. Density varied, trees under 15 feet in height, and
II. Open stand, trees over 15 feet in height.

A. Ten trees per plot that showed evidence of sawfly defoliation in 1961 were selected at random.

B. Current foliage of 1 twig from 5 different branches near mid-crown of each tree was sampled.*

C. The number of sample twigs bearing sawfly eggs was recorded for each tree.

D. The number of twigs bearing eggs from sample trees on the plot was totaled.

III. Closed stand, trees over 15 feet in height.

A. Only 5 trees that met the specifications of step A above were selected.

B. Same procedure as step B above, except that 10 different branches were sampled.*

C. Same as step C above.

D. Same as step D above.

*A pole pruner was needed to cut twigs from trees in type II and III stands.

The severity of the infestations in the six areas was classified by employing the following standards:

Average number of egg-bearing twigs per infested area*	Infestation severity	Predicted defoliation of old foliage in 1962 (Percent)
0 to 9	Light	0 to 25
10 to 19	Medium	25 to 50
20 or more	Heavy	50 to 100

*Sample unit: 1,000 twigs per area.

RESULTS

Sawflies defoliated between 50 to 100 percent of the 1960 foliage in six areas within the Little Rockies (fig. 1) during 1961. The amount of damage and a description of stands attacked in each area is explained in reports 1/ and 2/. Sawfly populations in all areas were classified as light in October. Predicted defoliation of 1961 foliage on these areas in 1962 is from 0 to 25 percent.

Area	Average number of twigs containing eggs in current needles	Infestation classification	Predicted defoliation in 1962 (Percent)
1	3.9	Light	0 - 25
2	1.5	Light	0 - 25
3	1.4	Light	0 - 25
4	0.7	Light	0 - 25
5	1.1	Light	0 - 25
6	2.2	Light	0 - 25

A total of 6,000 twigs from ponderosa and lodgepole pine trees were examined for sawfly eggs in the six areas: 7.3 percent of the twigs from ponderosa pines and 1.7 percent of the twigs from lodgepole pines contained sawfly eggs - an average of 3.7 percent for both types. Area 1 had the most abundant number of twigs containing eggs: 7.9 percent (table 1). Stands with open canopies and trees over 15 feet in height were observed to have the heaviest sawfly populations.

Results from egg viability counts made in October are listed below:

Tree species	Number of eggs examined	Number of viable eggs	Percentage of viable eggs
Lodgepole	405	366	90.4
Ponderosa	275	264	96.0
Totals	680	630	
Percent of total			92.7

Egg viability was greater in ponderosa pine twigs in 1960 and 1961 than in lodgepole pine twigs.

DISCUSSION

A polyhedrosis virus reduced the sawfly population in the Little Rockies to a low level by October 1961. Light defoliation is expected in 1962. Plans for controlling the sawflies in 1962 have been abandoned because the infestation is decreasing.

In the future it might be possible to control these two species of sawflies with an inoculum made from the virus which would be directed against the larvae.

Table 1.--Percentages of ponderosa and lodgepole pine twigs containing sawfly eggs in needles within the six areas.

	Twigs samples*		Percentages of twigs containing eggs		
Area	PP	LPP	PP	LPP	All twigs
1	255	745	19.2	4.1	7.9
2	655	345	3.7	1.7	3.1
3	170	830	7.1	2.0	2.9
4	125	875	2.4	1.3	1.5
5	405	595	4.4	0.7	2.2
6	570	430	7.3	0.5	4.4
Totals	2,180	3,820			
Averages			7.3	1.7	3.7

*Five twigs per tree

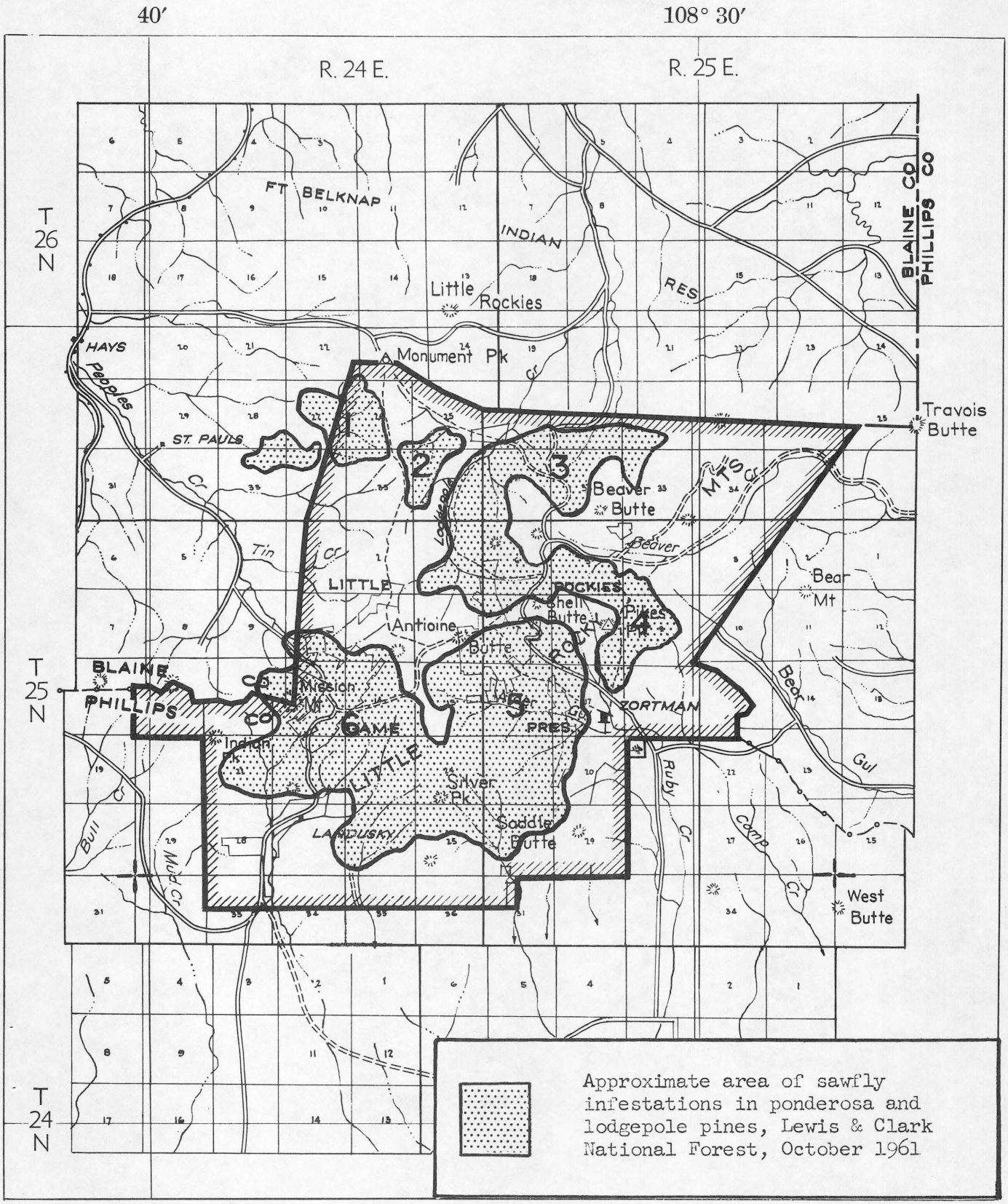

Figure 1.--Sawfly infested areas of ponderosa and lodgepole pines in the Little Rocky Mountains, Lewis and Clark National Forest, Montana.